

# WHAT IS CLAIMED IS:

1. An error correction method for protecting data by correcting a plurality of errors for data transmission, comprising the steps of:

first transmitting a coded sequence composed of a data and error correction codes added thereto, having small redundancy; and thereafter

transmitting either only data, the coded sequence of the data with an error correction code, only a check portion of error correction code for protecting any other error correction coded sequences, having a large correction capability for protecting the same data, or the entire coded sequence including the check portion, only a check portion of another error correction code having a large correction capability for protecting the coded sequence, or the entire coded sequence including the check portion.

2. The error correction method for protecting data by correcting a plurality of errors according to claim 1, wherein it is based on one error correction code parameter in data transmission according to claim 1, said method comprising the steps of: transmitting first a part of a coded sequence generated for data at a predetermined interval; and thereafter transmitting a remaining part, not having been transmitted first, of the coded sequence.

3. The error correction method according to claim 1, wherein the data transmitted first contains information regarding a data length, and the data is protected based on a third error correction code.

4. The error correction method according to claim 1, wherein a data sequence to be protected contains an error detection code.

5. The error correction method according to claim 3, wherein the data length is protected by the third error correction code or an error detection code, and is transmitted a plurality of times between the transmissions of coded sequences composed of the data and an error correction code therefor.

6. An error correction method for protecting data by correcting a plurality of errors in data transmission, said method comprising the steps of:

09911735-072501  
T05520-557F660

first executing decoding of the error correction coded sequence upon receiving data and an error correction code for protecting the data;

outputting a data sequence obtained by the decoding operation without receiving a subsequent sequence to be received if no errors are determined to be present in the data after the decoding, or alternatively receiving the subsequent coded sequence if errors are determined to be remaining; and

executing decoding of the subsequent error correction coded sequence by using the subsequently received coded sequence and the decoded result of the previously received coded sequence, or the previously received data sequence, and outputting a result of the decoding.

7. The error correction method according to claim 6, wherein the subsequent error correction coded sequence constitutes an error correction coded sequence for protecting another error correction coded sequence for protecting the data, and if errors are determined to be remaining, decoding is executed by using the result of decoding of the previously received error correction coded sequence, and the result of decoding of the error correction coded sequence for another error correction coded sequence, and data obtained by the decoding of said another error correction codes sequence is outputted.

8. The error correction method for protecting data according to claim 6, wherein it is based on one error correction parameter, and performed by correcting a plurality of errors, wherein the decoding is first executed for a part of the previously received error correction coded sequence, and the result of the decoding is outputted if no errors are determined to be present in the data after the decoding, whereas the decoding is executed after receiving the subsequent sequence to be received and rebuilding error correction coded sequence if errors are determined to be remaining, and then the result of the decoding is outputted.

9. The error correction method according to claim 6, wherein after the decoding executed by said another error correction coded sequence subsequently received, decoding is executed again of the previously received error correction coded sequence by using the decoded result of said another

09911735-072501

error correction coded sequence, and the previously received error correction coded sequence.

10. The error correction method according to claim 6, wherein the error correction coded sequence to be decoded first is composed of a plurality of code word sequence, and if an error is determined to be present in the decoding of the error correction coded sequence to be decoded, another error correction coded sequence to be subsequently decoded is decoded by using data regarding the previously decoded error correction coded sequence, and soft determination decoding is executed by using the number of corrected ones of the plurality of previously decoded error correction coded sequence or the number of received data errors, corresponding to decoding data obtained in the decoding of the previously decoded error correction coded sequence.

11. The error correction method according to claim 6, wherein if a data sequence to be protected contains an error detection code, after decoding by an error correction coded sequence containing the error detection code, determination is made as to presence of remaining errors based on the error detection code.

12. The error correction method according to claim 6, wherein data to be sent first contains information regarding a data length and, based on the result of decoding thereof, a code length or the number of code words of an error correction code, and a code length or the number of code words of another error correction code are estimated.

13. The error correction method according to claim 12, wherein the data length is protected by a third error correction code or the error detection code, the data length is received by a plurality of times between the receptions of data sequences composed of the data itself and an error correction code thereof and, if reception of a correct data length is determined by the third error correction code or the error detection code, based on the result of decoding thereof, a code length or the number of code words of an error correction code, and a code length or the number of code words of another error correction code are estimated.

09911735-072501

14. An error correction method for protecting data by a plurality of error correction codes in data transmission, wherein each of an error correction code B for coding data, and an error correction code A for coding only the data or a coded sequence of the error correction code B including the data, is composed of a plurality of code words.

15. The error correction method according to claim 14, wherein the error correction code B is set as a code to be subjected to soft determination decoding, and for decoding of the coded sequence of the error correction code B, the number of corrected one of the plurality of code words contained in the error correction code A corresponding to the coded sequence of the error correction code B is used for the decoding.

16. The error correction method according to claim 15, wherein data decoded by the error correction code B is decoded again by the coded sequence of the error correction code A regarding the data part thereof, and a result of the decoding and the number of corrected errors are used for decoding of the error correction code B.

17. An error correction apparatus for adding a function of protecting data by correcting a plurality of errors in data transmission, comprising:

data transmission means,

wherein the data transmission means includes: first coding means for generating a first coded sequence with error correction code A for data; storing means for storing the data or a first coded sequence; second coding means for generating a second coded sequence with error correction code B for protecting the data in the storing means, or the first coded sequence; and outputting means for first transmitting all of the first coded sequence composed of the data and the first error correction code A, and then transmitting either only the data, a check part of the second error correction code B, or a second coded sequence.

18. An error correction apparatus for adding an error correcting function of protecting data based on one error correction code parameter for

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data transmission, comprising:

data transmission means,

wherein the data transmission means includes: coding means for generating a coded sequence for data; storing means for storing all or a part of the coded sequence; and transmission procedure means for first transmitting a part of the coded sequence at a predetermined interval, and subsequently transmitting the coded sequence having not been transmitted previously.

19. An error correction apparatus for adding a function of protecting data by correcting a plurality of errors for data transmission, comprising:

data transmission means,

wherein the data transmission means includes: second coding means for coding data by a second error correction code B; and first coding means for coding a coded sequence of the first error correction code A for coding the data or a coded sequence containing data outputted from the second coding means, by a plurality of code words.

20. An error correction apparatus having a function of protecting data by correcting a plurality of errors for data transmission, comprising:

decoding means for decoding a data sequence,

wherein the decoding means includes: first decoding means for decoding a plurality of code words constituting a first error correction code A for protecting only data or for further protecting a second error correction code B for data protection, and outputting the number of corrected code words; and second decoding means for subjecting the second error correction code B to soft determination decoding by using decoded data of the first decoding means, and the number of corrected ones of a plurality of block codes constituting the first error correction code A.

21. An error correction apparatus having a function of correcting data by a plurality of error correction codes for data transmission, comprising:

data receiving means for decoding a data sequence, and outputting the decoded data sequence,

0911735-072501

wherein the data receiving means includes: a plurality of decoding means for sequentially decoding a plurality of error correction codes; determining means for making determination as to presence of an error in a decoded result of each error correction code; and outputting means for outputting the decoded result if presence of no errors is determined by the determining means.

22. An error correction apparatus comprising:

data receiving means for correcting data by correcting a plurality of errors in data transmission,

wherein the data receiving means includes: a first decoding means for decoding data by a first error correction code A for protecting data and a check of a second error correction code B added to the data; determining means for making determination as to presence of an error in a decoded result of the data; storing means for storing the data decoded by the first error correction code A; a second decoding means for decoding data by the second error correction code B based on the data stored by the storing means and the check of the second error correction code added to the data decoded by the first error correction code A; and outputting means for outputting the decoded result of the data decoded by the first error correction code A if presence of no errors is determined in output data from said first and second decoding means by the determining means, or alternately outputting the data decoded by the second error correction code B.

23. An error correction apparatus having a function of correcting data by a plurality of error correction codes in data transmission, comprising:

data receiving means for decoding a data sequence, and outputting the decoded data sequence,

wherein the data receiving means includes: storing means for storing a sequence to be received; first decoding means for decoding a data sequence based on a coded sequence partially transmitted previously at a predetermined interval; determining means for making determination as to presence of an error in a result of the coding, and finishing the decoding if presence of no errors is determined; and second decoding means for

0911735-072501

executing decoding including a subsequent sequence to be received if presence of an error is determined.

24. The error correction apparatus according to claim 23, wherein the first decoding means for decoding the previously received coded sequence is commonly used with the second decoding means for executing decoding including the subsequent sequence to be received.

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